LGIS High Voltage Transmission & Distribution Business

2000. LGIS UIHV

LGIS High Voltage Transmission & Distribution Business

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LGIS High Voltage Transmission & Distribution Business

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2 Products & Services

3 145kV SF_6 Gas Insulated Switchgear

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- 3-7. Typical Arrangements

4 Reference Construction of 145kV 40kA 2000A GIS

LG Power T&D Division offers a complete range of equipment, system and services for the safe and efficient transmission and distribution of electric power

- HV Open (Air) and SF_6 Gas Insulated Switchgear
- Engineering & Construction of Substation and Transmission Line
- Medium & Low Voltage Swithgear and Board
- Control and Relay Protection Panel
- Cast Resin Transformer
- SCADA System

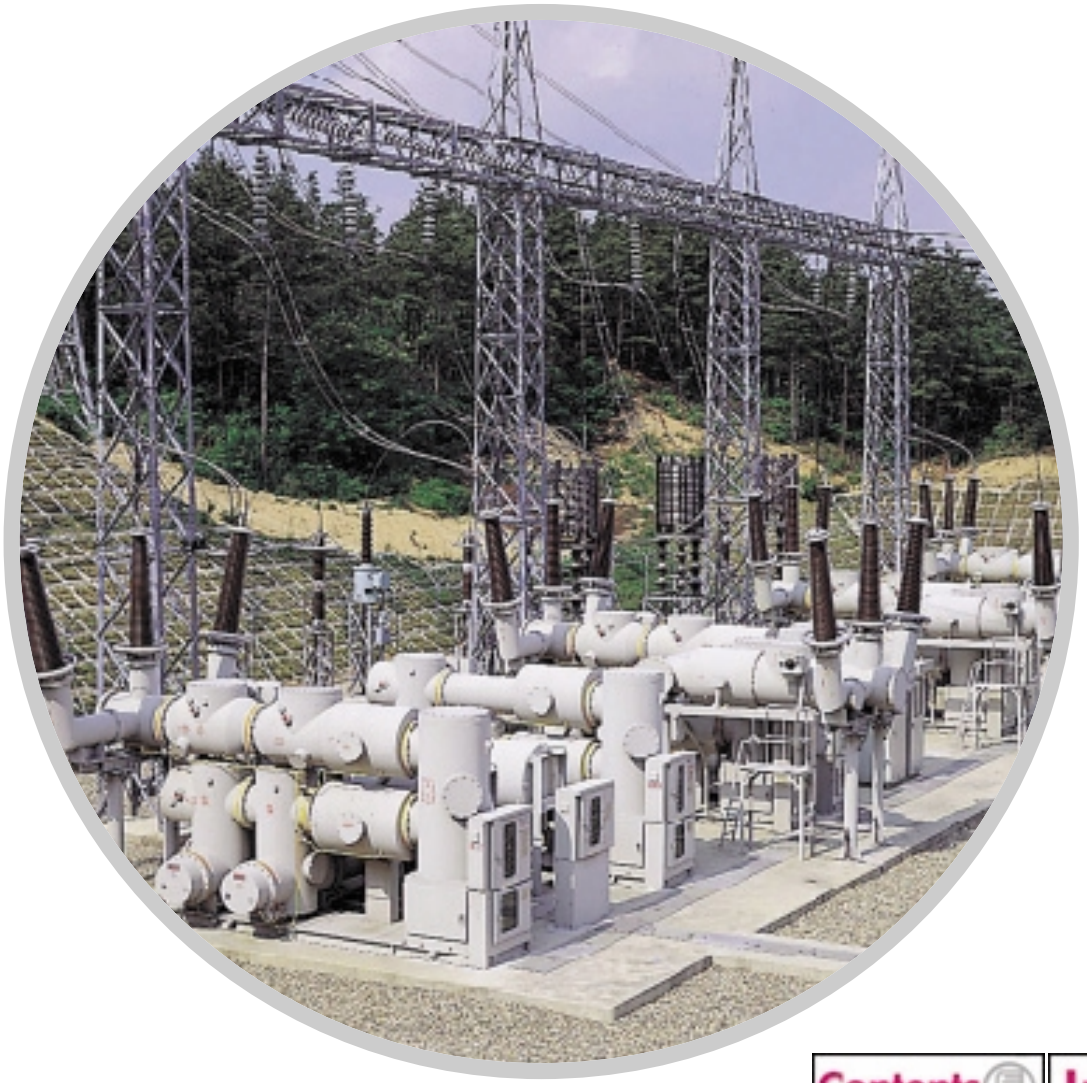
1. 362 / 170kV SF_6 Gas Insulated Switchgear
2. SF_6 Gas Circuit Breaker (Dead Tank Type)
3. 145kV SF_6 Gas Insulated Switchgear
4. 72.5kV SF_6 Gas Insulated Switchgear (for Railway)
5. SF_6 Gas Insulated Switchgear (Compact Type)
6. Isolated Phase Busbar (I. P. B)
7. Open Type Substation and Tranmission Line
8. Electrical System Diagnosis

369kV SF_6 Gas Insulated Switchgear

Specification

- Rated Votage: 362kV
- Rated Continuous Current: 4000A
- Rated Breaking Current: 40kA
- Rated Making Current: 100kA
- Rated P.F. Voltage: 450kV
- Rated L.I.W. Voltage: 1175kV
- Rated S.I.W. Voltage: 950kV
- Duty Cycle: O-0. 3sec-CO-3min-CO
- Mechanism: Hydraulic (CB), Motor (DS)
- Termination: Air Bushing (Overhead Line)
  Cable Head (Underground)

170kV SF_6 Gas Insulated Switchgear (for outdoor)



Specification

- Rated Votage: 170kV
- Rated Continuous Current:1200 ~ 4000A
- Rated Breaking Current: 31.5 / 50kA
- Rated Making Current: 80 / 125kA
- Rated P.F. Voltage: 325kV
- Rated L.I.W. Voltage: 750kV
- Duty Cycle: O-0. 3sec-CO-3min-CO
- Mechanism: Hydraulic (CB), Motor (DS)
- Termination: Air Bushing (Overhead Line)
  Cable Head (Underground)

170kV SF_6 Gas Insulated Switchgear (for outdoor)

Specification

- Rated Votage: 170kV
- Rated Continuous Current:1200 ~ 4000A
- Rated Breaking Current: 31.5 / 50kA
- Rated Making Current: 80 / 125kA
- Rated P.F. Voltage: 325kV
- Rated L.I.W. Voltage: 750kV
- Duty Cycle: O-0. 3sec-CO-3min-CO
- Mechanism: Hydraulic (CB), Motor (DS)
- Termination: Air Bushing (Overhead Line)
  Cable Head (Underground)

SF_6 Gas Circuit Breaker (Dead Tank Type)

Specification

- Rated Votage: 170kV
- Rated Continuous Current: 1200 ~ 2000A
- Rated Breaking Current: 31.5kA
- Rated Making Current: 80kA
- Rated P.F. Voltage: 325kV
- Rated L.I.W. Voltage: 750kV
- Duty Cycle: O-0. 3sec-CO-3min-CO
- Operating Mechanism: Hydraulic

145kV SF_6 Gas Insulated Switchgear

Specification

- Rated Votage: 145kV
- Rated Continuous Current: 630 ~ 3150A
- Rated Breaking Current: 40kA
- Rated Making Current: 104kA
- Rated P.F. Voltage: 275kV
- Rated L.I.W. Voltage: 650kV
- Duty Cycle: O-0. 3sec-CO-3min-CO
- Mechanism: Hydraulic (CB), Motor(DS)
- Termination: Air Bushing (Overhead Line)
  Cable Head (Underground)

72.5kV 2-Pole SF_6 Gas Insulated Switchgear (for Railway System)

Specification

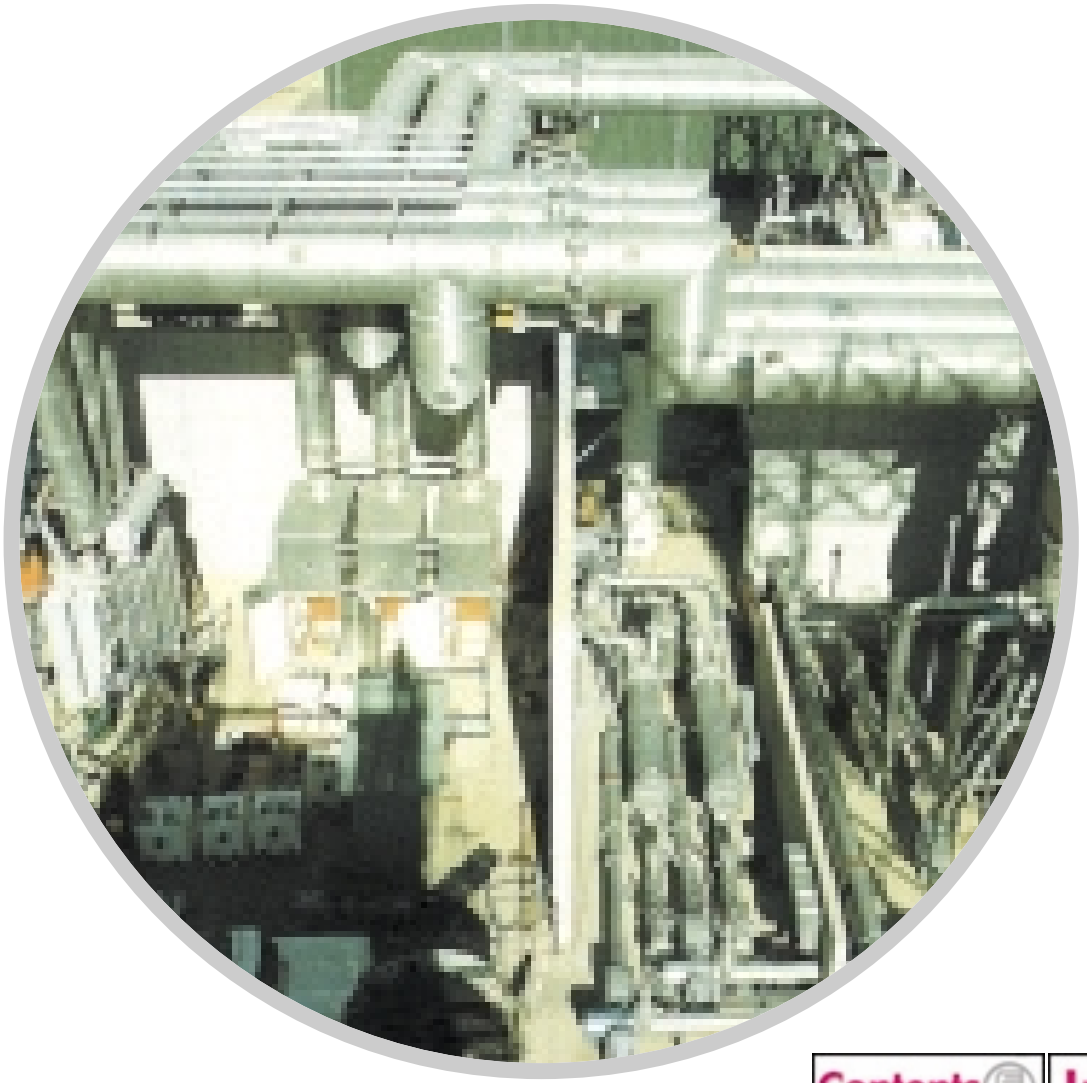
- Rated Votage: 72.5kV
- Rated Continuous Current: 1200 ~ 2000A
- Rated Breaking Current: 20kA
- Rated Making Current: 50kA
- Rated P.F. Voltage: 140kV
- Rated L.I.W. Voltage: 325kV
- Duty Cycle: O-0. 3sec-CO-3min-CO
- Mechanism: Hydraulic (CB), Motor(DS)
- Termination: Air Bushing (Overhead Line)
  Cable Head (Underground)

Medium Voltage SF_6 Gas Insulated Switchgear (Compact Type)

Specification

- Rated Votage: 25.8kV
- Rated Continuous Current: 630 ~ 2000A
- Rated Breaking Current: 25kA
- Rated Making Current: 63kA
- Rated P.F. Voltage: 50kV
- Rated L.I.W. Voltage: 125kV
- Duty Cycle: O-0. 3sec-CO-3min-CO
- Arc Chamber: Vacuum Interrupter
- Enclosure material: Aluminum
- Mechanism: Motor Charged Spring (CB)
  Motor 3 WAY Switch (DS)

Isolated Phase Busbar



Specification

- Rated Votage: 4.16 ~ 24kV
- Rated Current: 5000 ~ 20,000A
  (Self Cooling)
  20,000 ~ 50,000A
  (Forced Cooling)
- Rated Short Circuit Current : 200 ~ 300kA

Features

- No Inter Phase Fault.
- High Short Circuit Current Capability.
- No Maintenance (No infiltration of dust)
- No Magnetic Field Induction.

Open Type Substation and Transmission Line

Turn-key based project or Engineering package project

Transmission Line

- Underground Cable T/L(200SQ ~ 2000SQ)
- Overhead T/L

Substation

- 22.9/154 & 345kV Substation Construction
- Substation Cabling Work

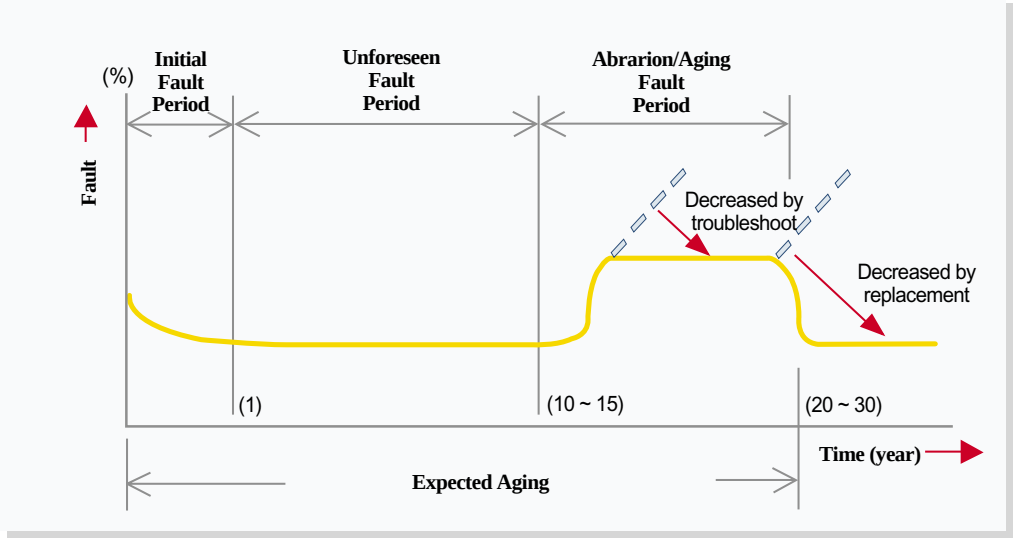
Substation design

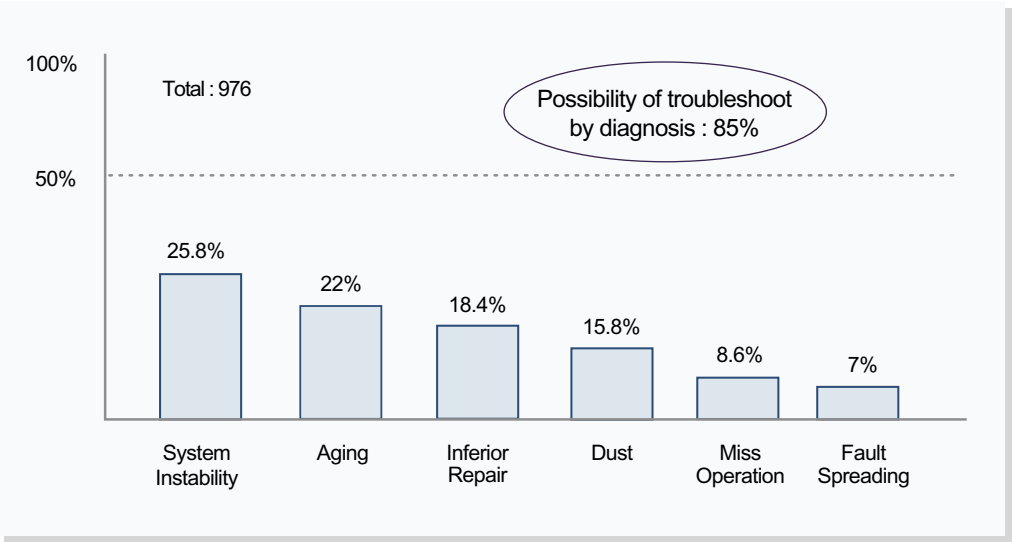
- Layout Design
- Foundation Design
- Mesh Calculation & Design
- Other Detail Design

System Study

- Fault Current Calculation
- Relay Coordination
- Harmonic Analysis
- System Stability

Electrical System Diagnosis





System Diagnosis

- Equipment Reliability Check
- Capability Calculation
- Voltage Drop & Motor Starting
- Protective Relay Setting

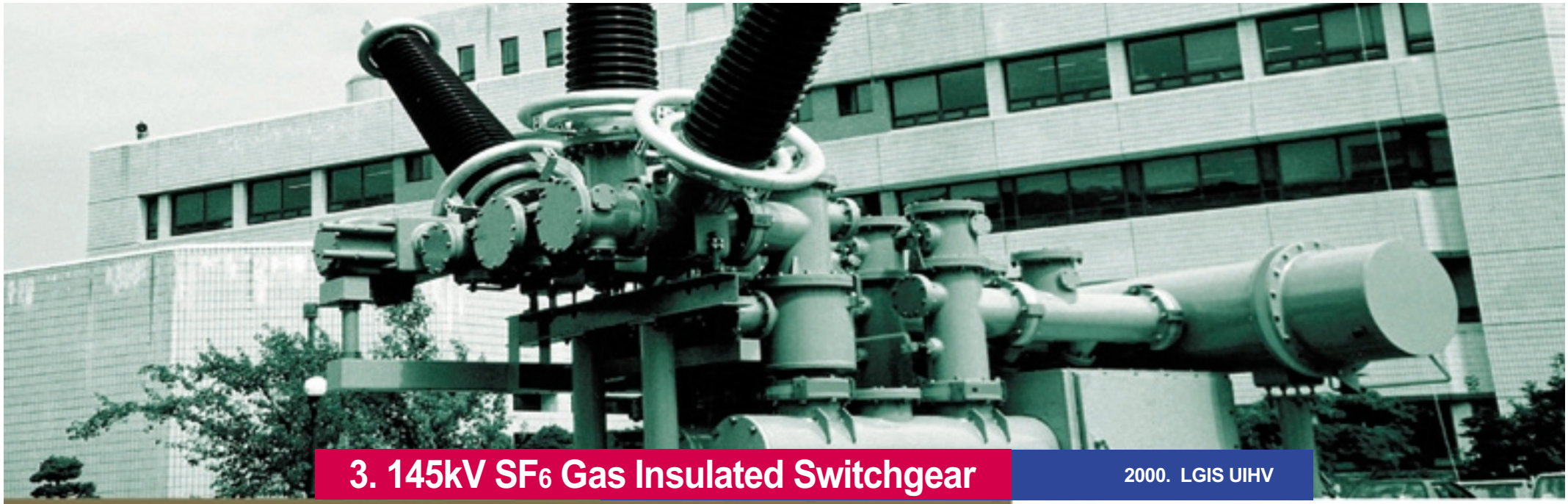
Repair & Replacement

- Renewal
- Refresh

Maintenance & Overhaul

- GIS, Switchgear
- GCB, VCB, ACB, TR

System ON-LINE Monitoring



3. 145kV SF_6 Gas Insulated Switchgear

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SF_6 Gas Insulated Switchgear for Ratings of 145kV 40kA

3-1. Specifications

NO	ITEM		RATINGS
1.	Type		GESG 1440
2.	Rated voltage		145kV,rms
3.	Rated frequency		50/60Hz
4.	Rated normal current	CB, Main circuit Bus	2000A 3150A
5.	Phase arrangement	CB, Main circuit Bus	3Phase segregated 3Phase encapsulated
6.	Rated short-circuit breaking current		40kA,rms
7.	Rated short-circuit making current		104kA,peak
8.	Rated short-time withstand current and duration		40kA,rms / 3sec
9.	Power-frequency withstand voltage	To earth, between phases Across the open gap of CB,ES / DS	275kV,rms 275 / 315kV,rms
10.	Lightning Impulse withstand voltage	To earth, between phases Across the open gap of CB,ES / DS	650kV,peak 650/750kV,peak
11.	First Pole to Clear Factor		1.3 / 1.5
12.	Rated control and supply voltage for auxiliary circuit		DC 110V
13.	Rated SF6 gas pressure		0.6MPa (abs)
14.	Rated operating pressure of hydraulic equipment		32MPa (abs)

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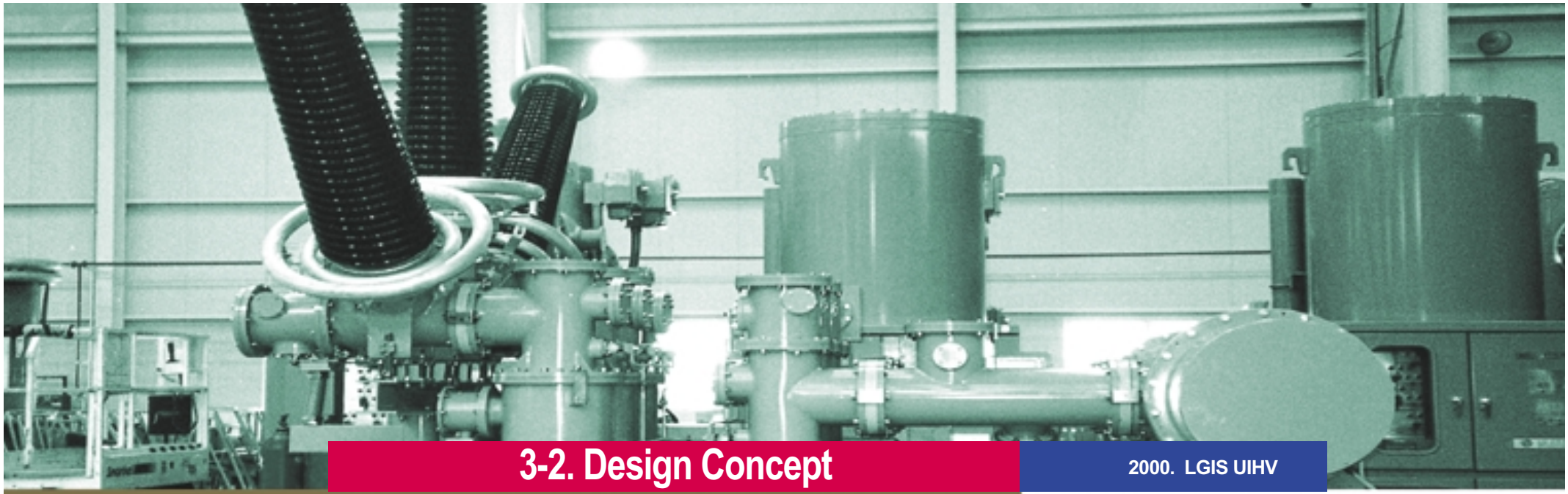

3-2. Design Concept

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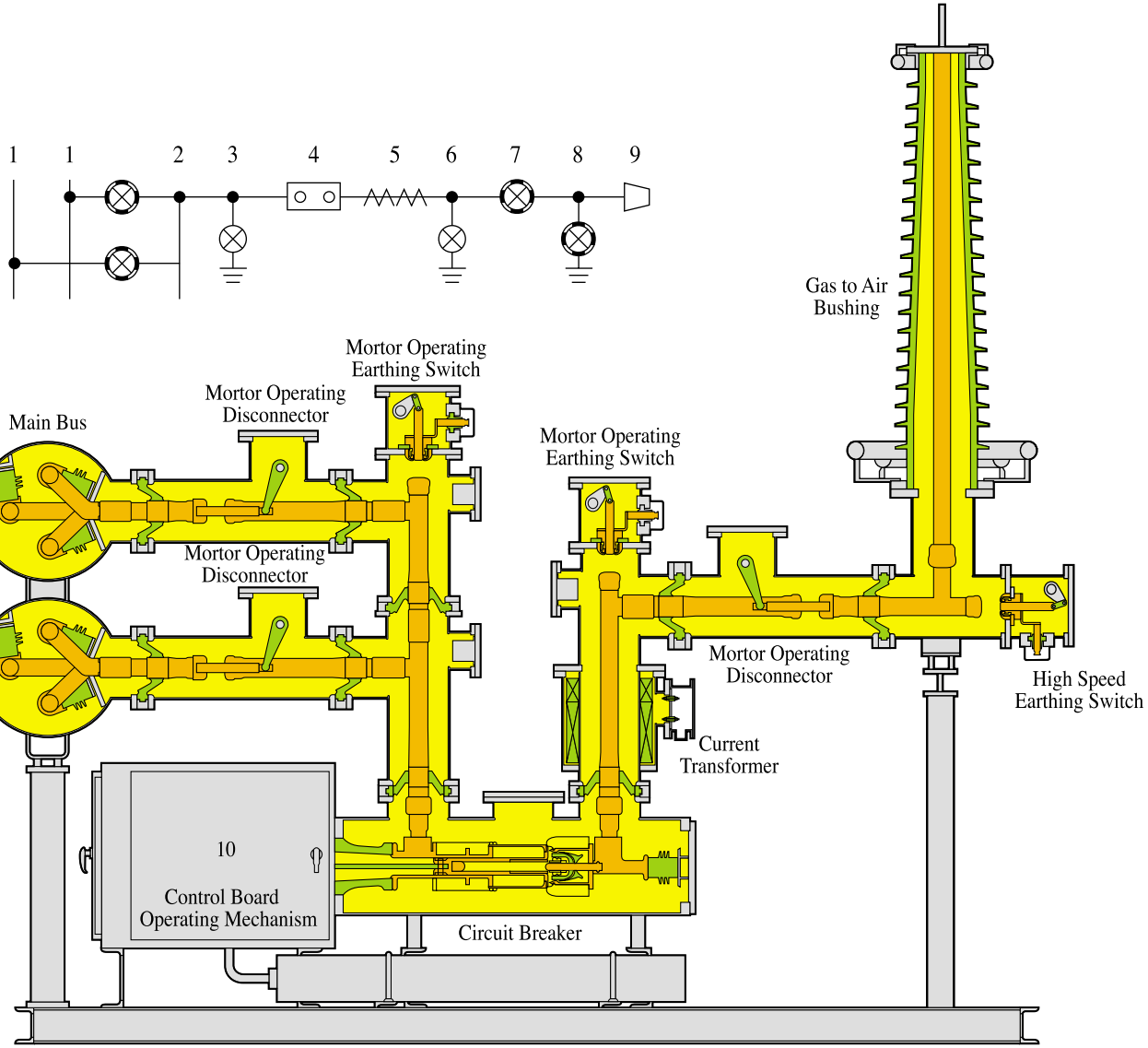
- High Reliability
- Compact Design
- Maintenance free
- Steel Enclosure
- Modular Design
- Diverse Application

3-3. Typical Section View(Overhead Line)



NO	DESCRIPTION
1	Main Bus
2	Disconnector
3	Earthing Switch for Maintenance
4	Circuit Breaker
5	Current Trancformer
6	Earthing Switch for Maintenance
7	Disconnector
8	Earthing Switch for Making proof
9	Gas to Air Bushing
10	Local Control Panel

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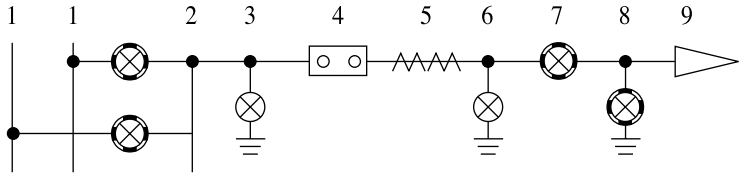
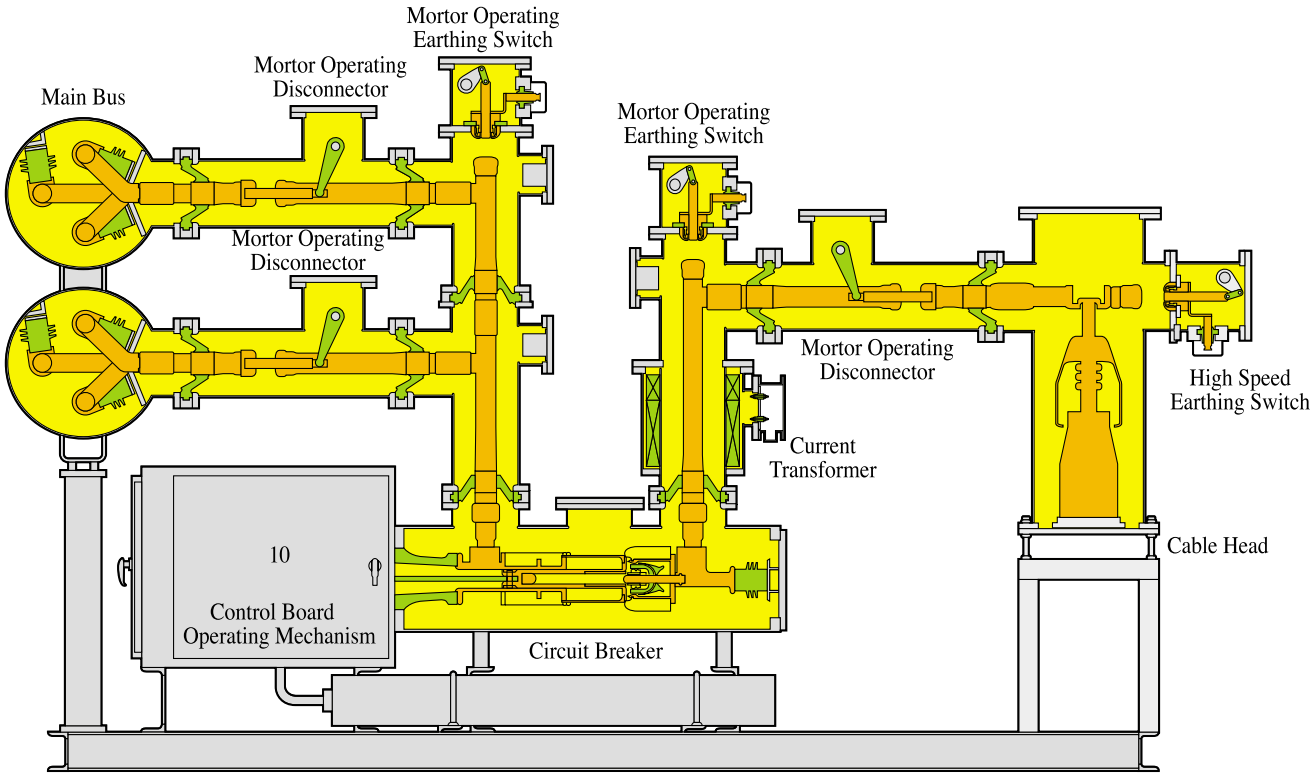
3-3. Typical Section View(Overhead Line)





NO	DESCRIPTION
1	Main Bus
2	Disconnector
3	Earthing Switch for Maintenance
4	Circuit Breaker
5	Current Trancformer
6	Earthing Switch for Maintenance
7	Disconnector
8	Earthing Switch for Making proof
9	Gas to Air Bushing
10	Local Control Panel

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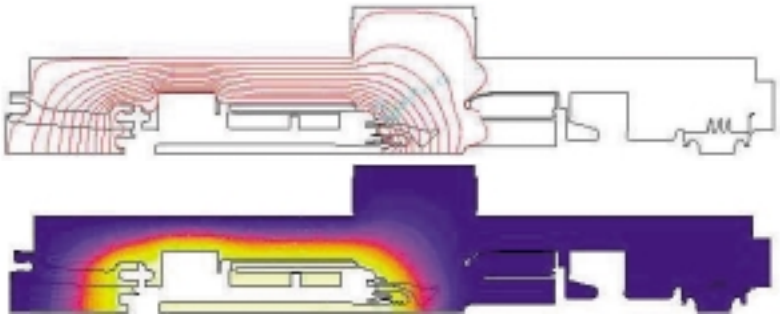
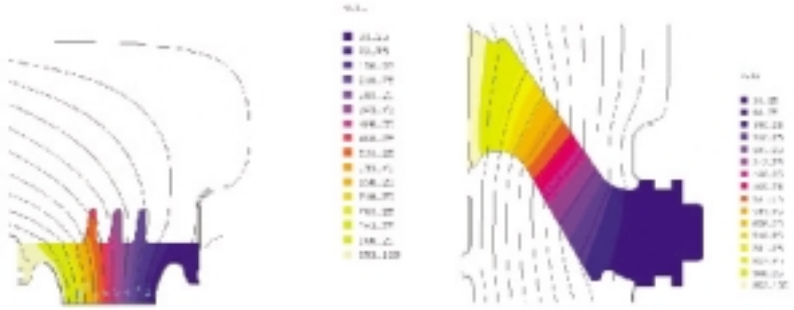
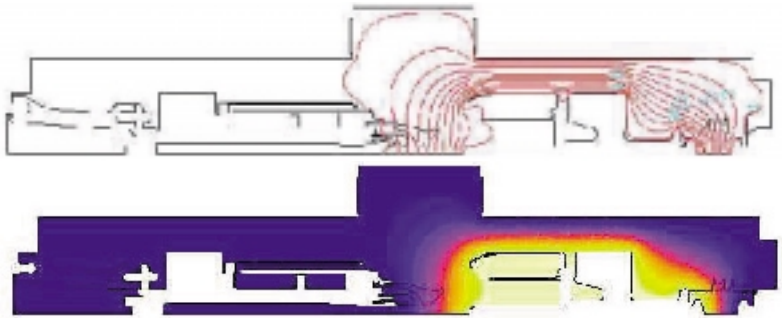
Electric Field Analysis



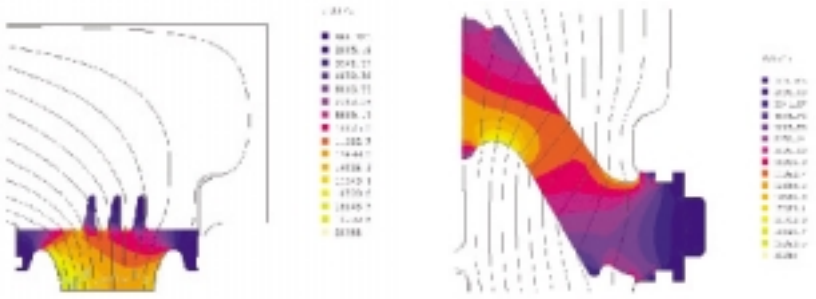
Equal-potential diagram and color shade of voltage distribution for across the open gap of circuit breaker. Charged at moving-side of CB to 650kV



Color shade of voltage distribution for epoxy. Charged at live-part to 650kV



Equal-potential diagram and color shade of voltage distribution for across the open gap of circuit breaker. Charged at fixed-side of CB to 650kV



Color shade of electric field distribution for epoxy. Charged at live-part to 650kV

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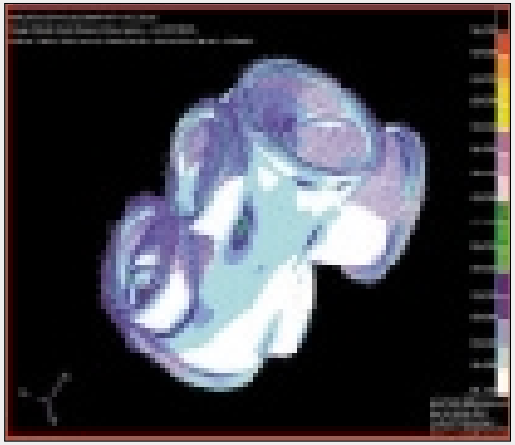
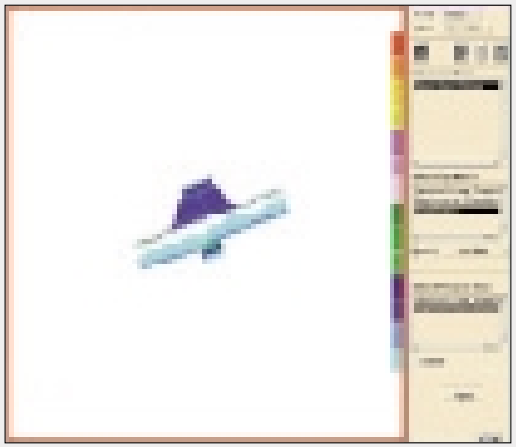
3-4. Design & Analysis

Static Force Analysis

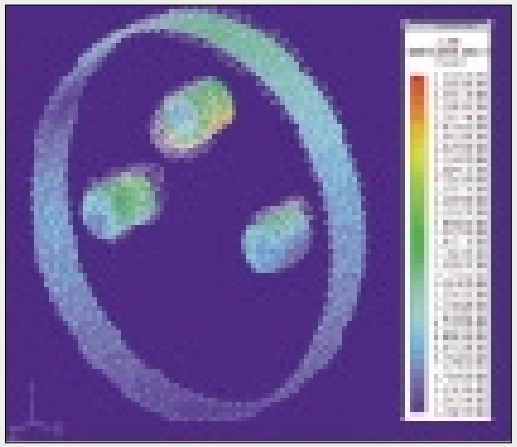


Strain Distribution of Enclosure

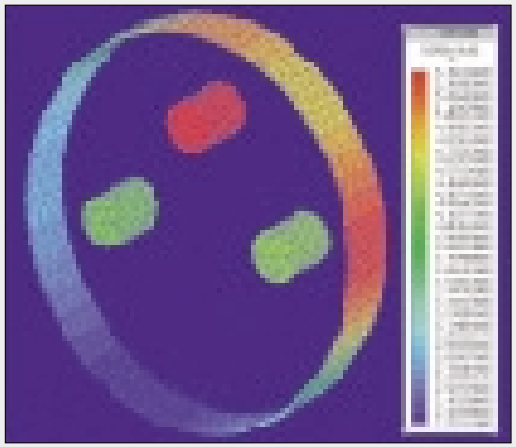


Strain Distribution of Spacer

Magnetic Field Analysis

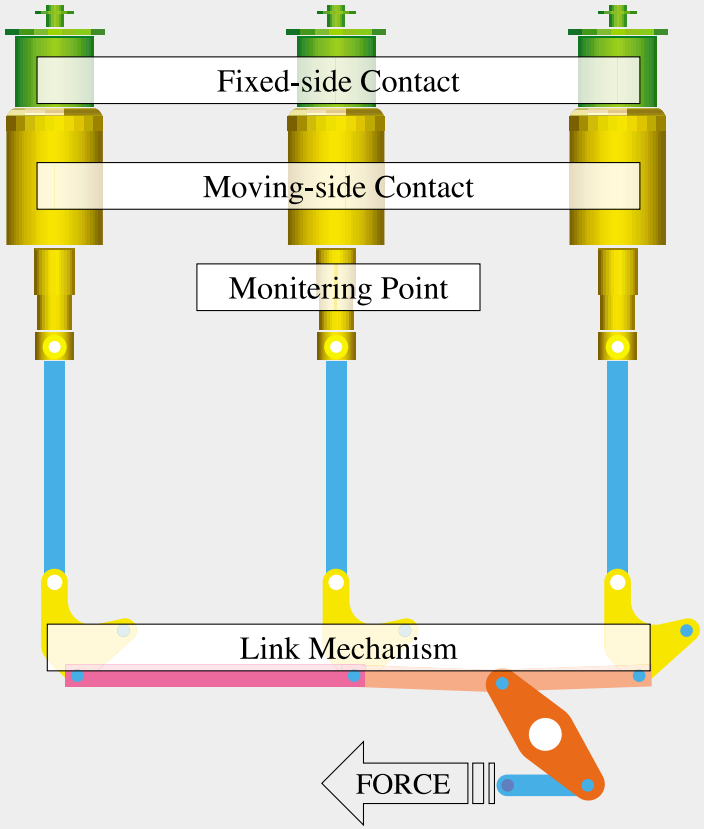


Magnetic field Distribution for Main Bus



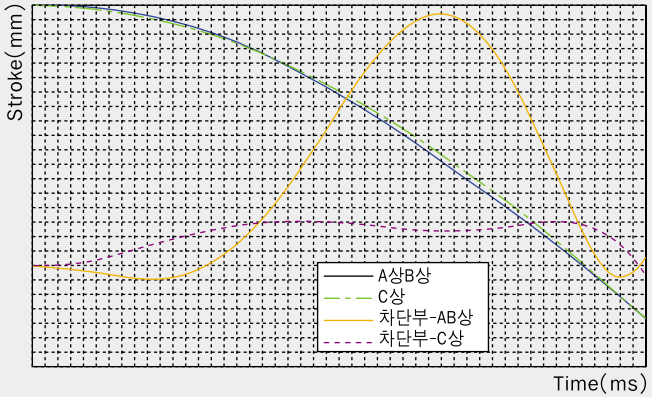
Temperature Distribution of Main Bus

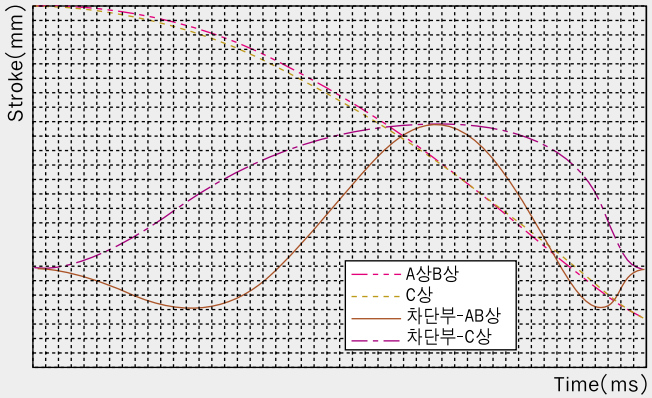
Dynamic Force Analysis



Dynamic Analysis for Link Mechanism

Analyze the Dynamic Force and Optimize the Movement





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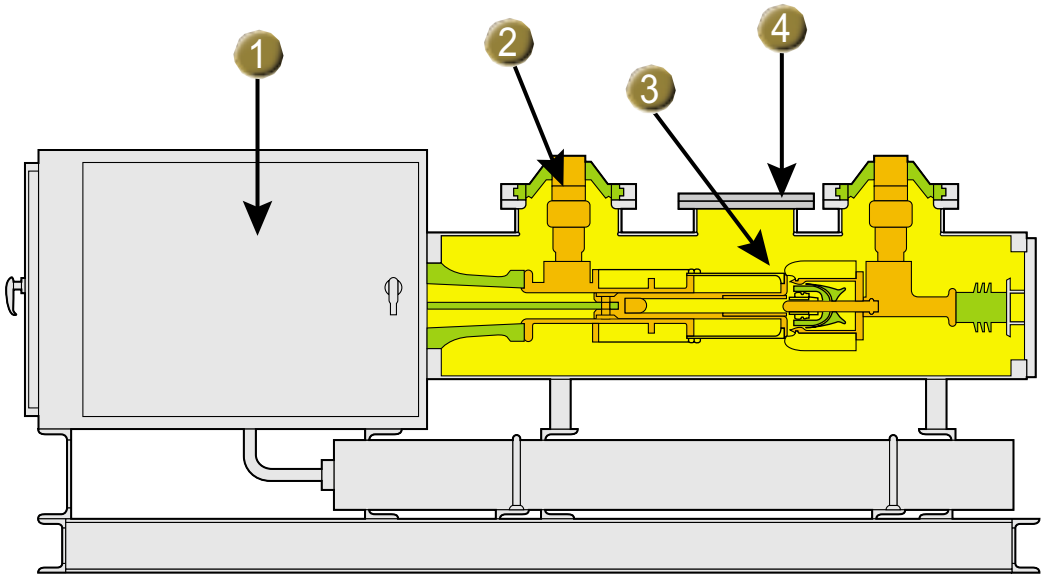
3-5. Structures

1. Control Box
2. Conductor
3. Interrupting Chamber
4. Enclosure



Circuit Breaker

Three-phase Segregated Enclosure

- Three phase segregated
- Easy inspection or maintenance

Hydraulic Operating Mechanism

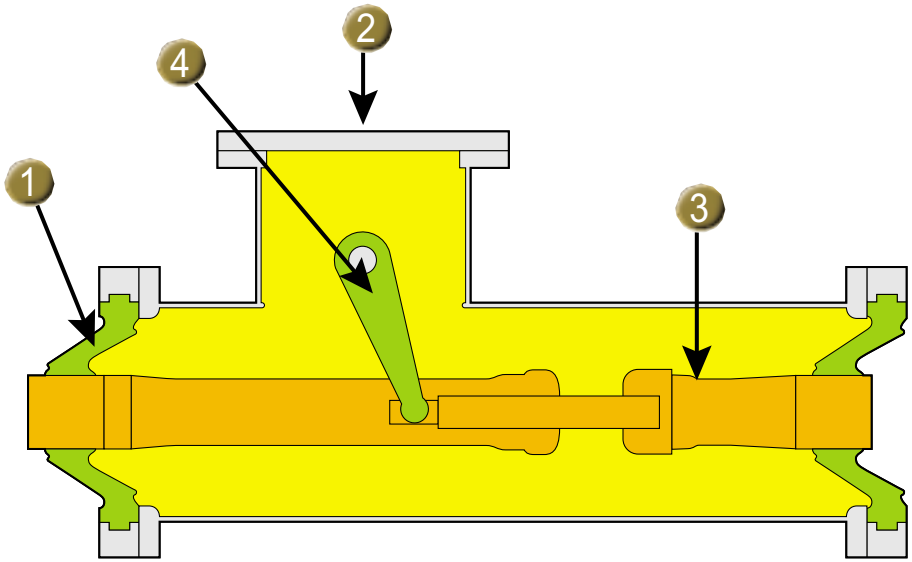
- Compact size
- Maintenance free
- High operating power
- Accumulator

Interrupting Chamber

- Reliable arc quenching
- Double flow
- Puffer cylinder

3-5. Structures

1. Cone Insulator
2. Enclosure
3. Conductor
4. Insulation Lever



Disconnector

Modular Unit Design

- Separated gas compartment
- Diverse mounting direction
- Easy exchange of inner part

Reliable Performance

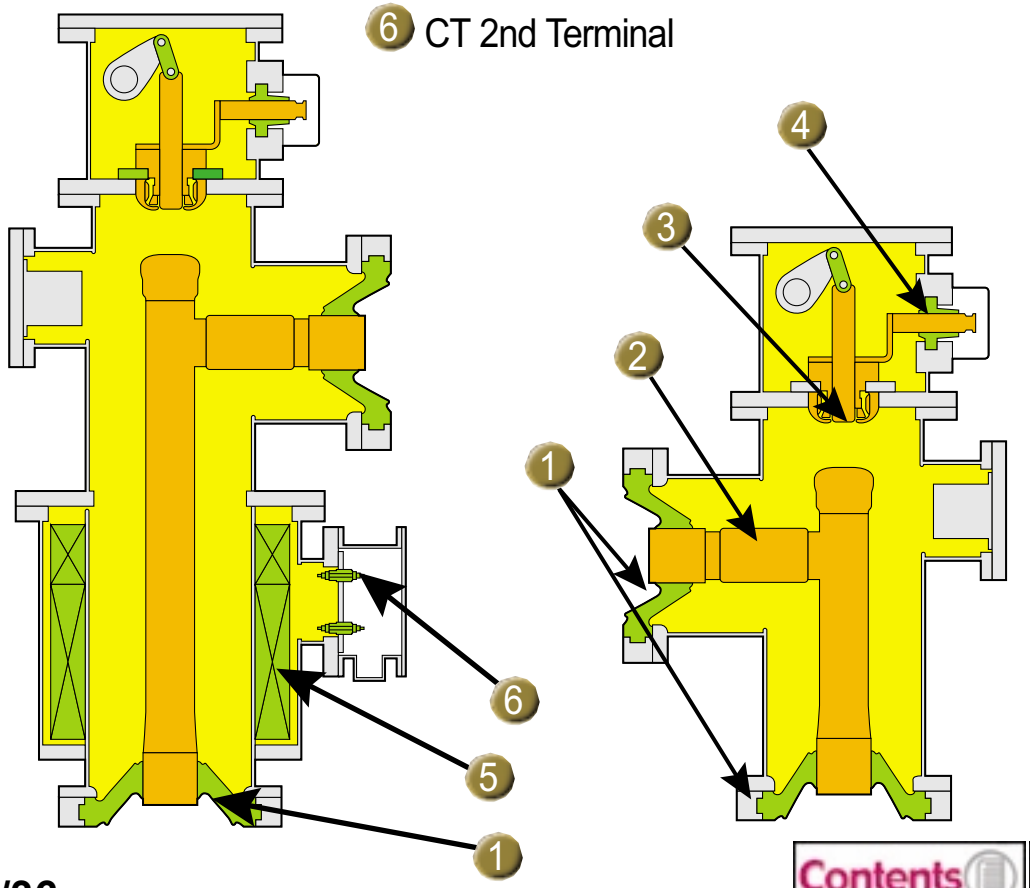
- Switching bus transfer current
- High insulation performance
- Mechanical endurance

Motor Operating Mechanism

- Ball-screw type spindle axis
- Min. frictional losses
- Link mechanism protection

3-5. Structures

1. Cone Insulator
2. Conductor
3. Earthing Switch
4. Megger Terminal
5. Current Transformer
6. CT 2nd Terminal



Current Transformer & Earthing Switch for Maintenance

Current Transformer

- Single or both side of Circuit Breaker.
- Flexible CT height

Earthing Switch for Maintenance

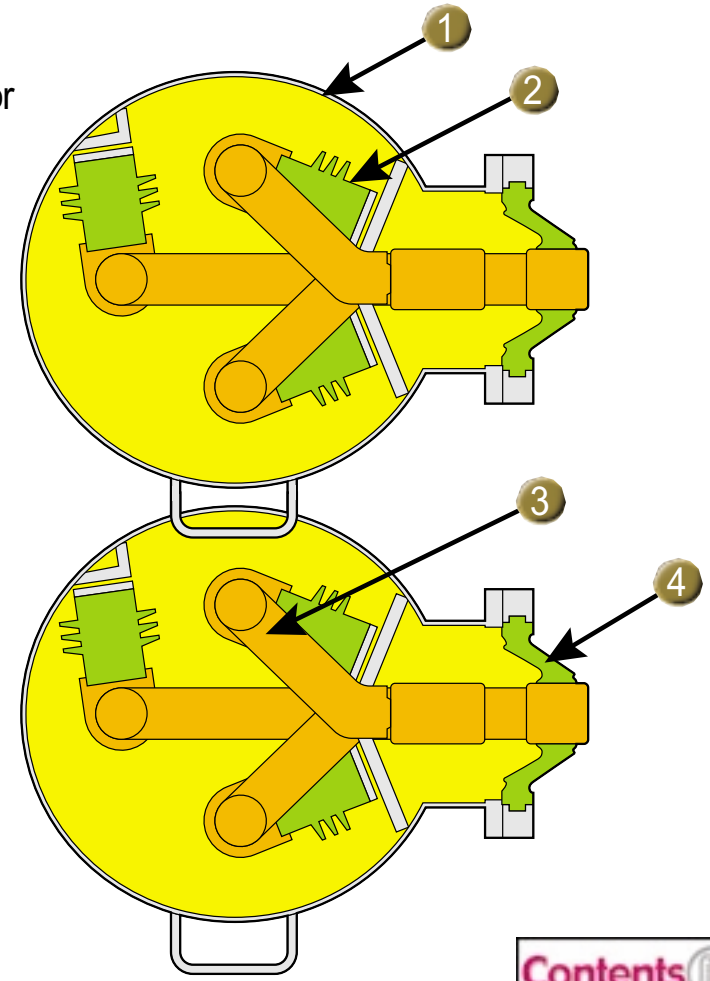
- Manual operating mechanism
- Link mechanism protection
- Diverse position

High Performance Absorbent

- Filter is equipped at the inspection cover

3-5. Structures

1. Enclosure
2. Post Insulator
3. Conductor
4. Cone Insulator



Main Bus

Three-phase Encapsulated Main Bus

- Easy connection to branch circuit
- The same unit for double bus

Insulating Barrier

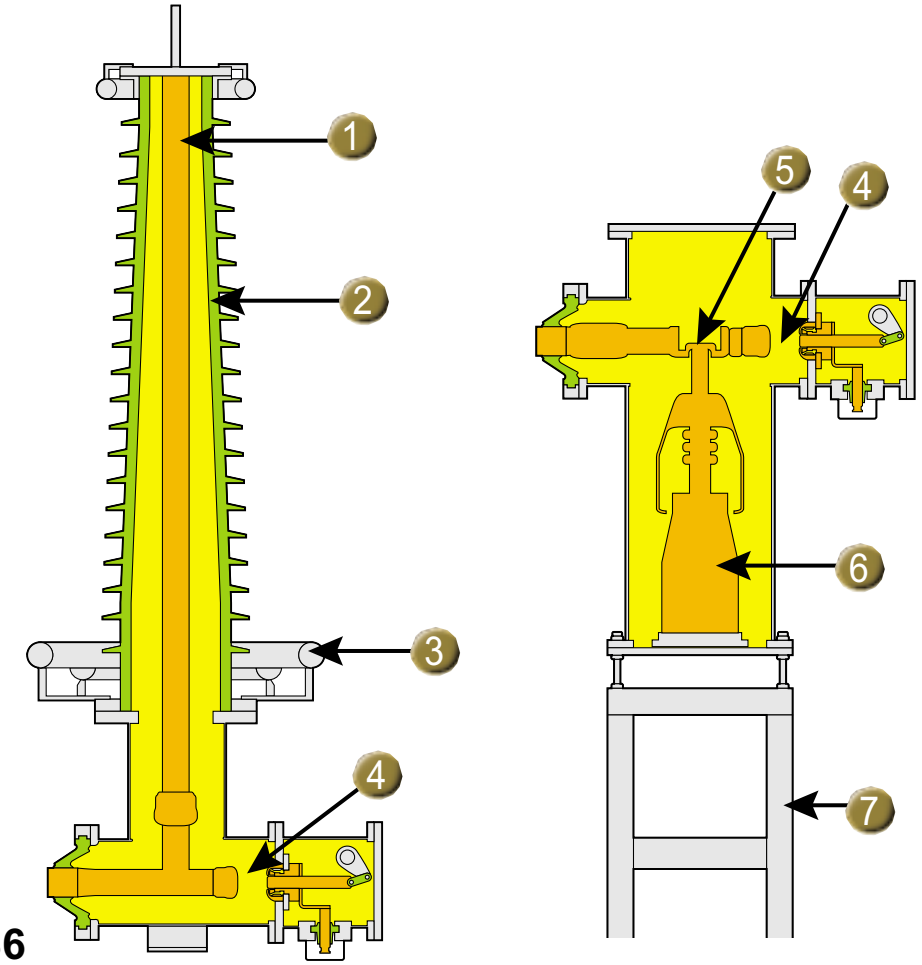
- Cone Insulator for single phase barrier
- Disc shape Insulator for three phase barrier

Single-phase Post Insulator

- Single-phase Post Insulator for supporting conductor.

3-5. Structures

1. Conductor
2. Porcelain
3. Lower Shield
4. Make Proof Earthing Switch
5. HV Connection
6. Cable Termination
7. Support



Gas to Air Bushing / Cable Head & Earthing Switch

Easy Connection

- Porcelain Bushing for air connection
- Cable Head for underground connection.
- Flexible location

Earthing Switch for Making

- Making proof high speed Earthing Switch
- Motor driven spring charged operating mechanism

3-6. Test of Certificate

Type Test Certificate

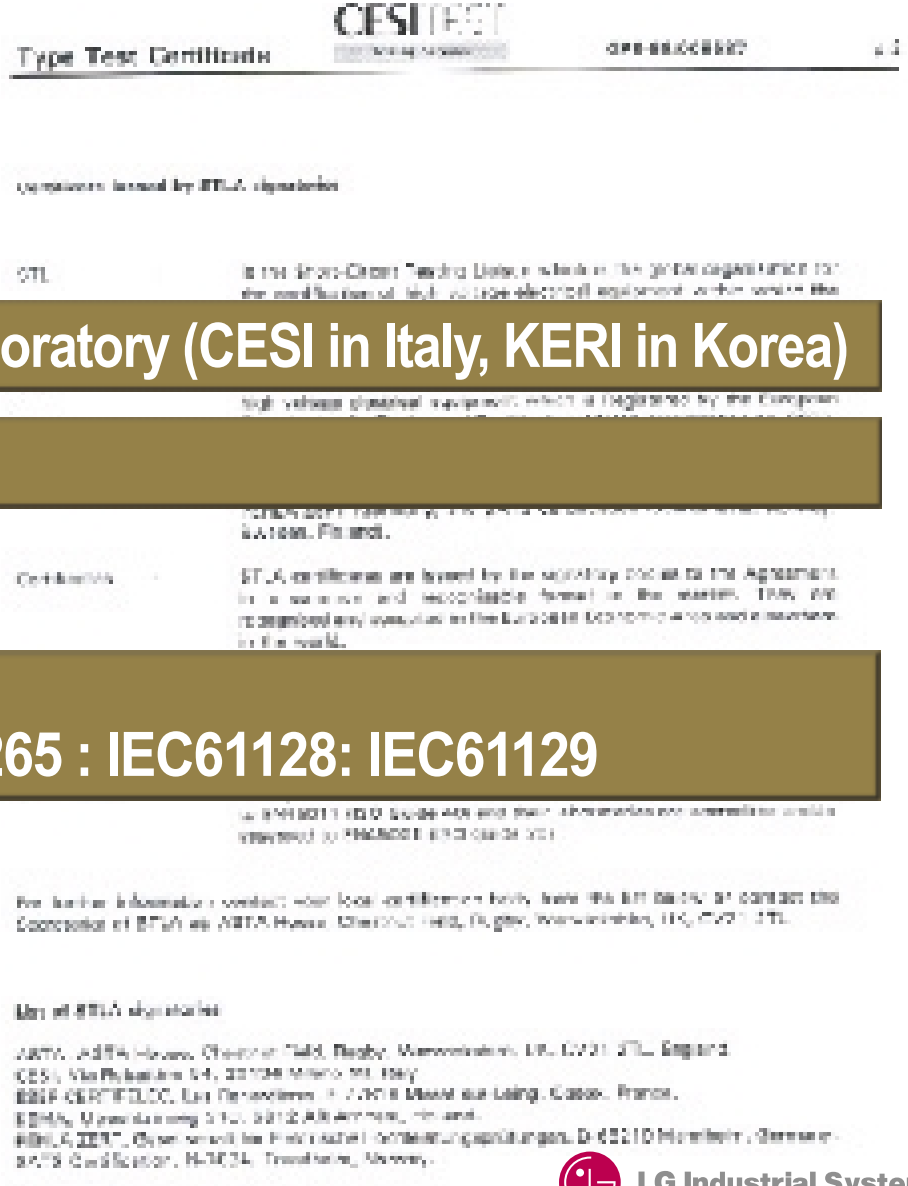
CESI

STLA

Performed Type Test at Independent Test laboratory (CESI in Italy, KERI in Korea)

Applicable Standards

Applied Standards
: IEC60056 : IEC60427 : IEC60517 : IEC60265 : IEC61128: IEC61129


Type Test Certificate

CESI

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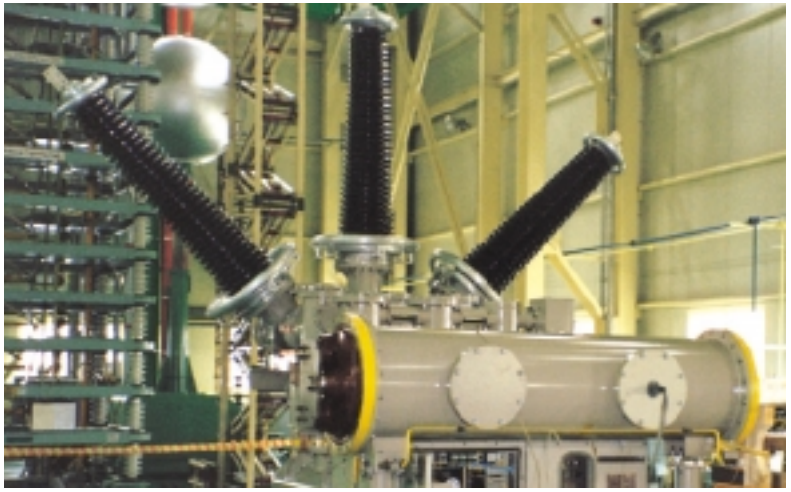
3-6. Test of Certificate

Short-circuit and Switching Performance Test at CESI

Specifications of Circuit Breaker

NO	DESCRIPTION		RATING
1	Rated vlotage		145kV,rms
2	Rated normal current		2000A,rms
3	Rated frequency		60Hz
4	Rated making current		104kA,peak
5	Rccated breaking current		40kA,rms
6	Rated short-time withstand current		40kA,rms/3sec
7	Transient	F.P.C.F	1.3 & 1.5
	Recovery	peak	249kV
	Voltage(TRV)	ratio of rise	2.0kV/μs
8	Rated operating duties	0-0.3s-CO-3min-CO	
9	Rated filling pressure of SF6 gas		0.6MPa,abs
10	Rated hydraulic operating pressure		32MPa,abs
11	Rated supply and control voltage		110V d.c.



Test Item and performance

NO	TEST ITEM	ADDLIED
1	Short-time withstand current test	Standards
2	Line-charging current switching test	
3	Cable charging current switching test	IEC60056
4	Out-of-phase current switching test	IEC60427
5	Basic short circuit test	
6	Short-line fault test	

3-6. Test of Certificate

Specifications for GIS

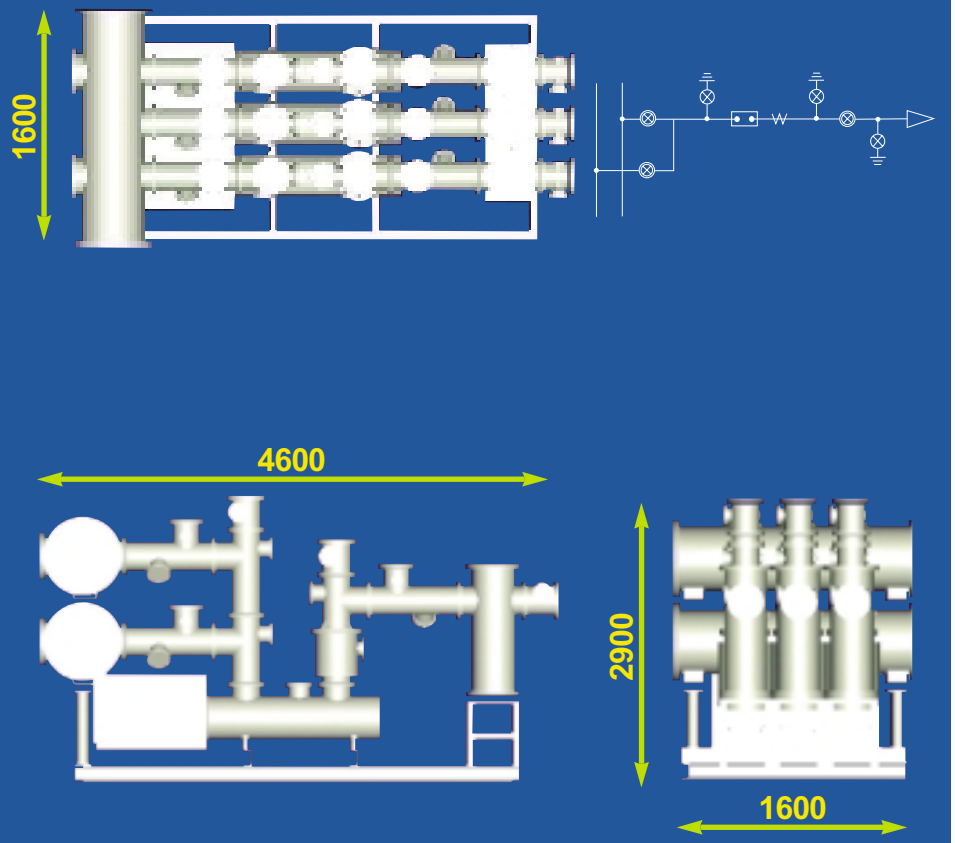
NO	DESCRIPTION		RATING
1	Rated vlotage		145kV,rms
2	Rated normal current	main circuit	2000A,rms
		bus	3150A,rms
3	Rated frequency		60Hz
4	Rated short-time withstand current		40kA,rms/3sec
5	Power frequency withstand voltage		
	To earth, between phases for bus		275kV,rms
	Across the open gap for DS/other switches		315/275kV,rms
6	Lightning impulse withstand voltage		
	To earth, between phases for bus		650kV,rms
	Across the open gap for DS/other switches		750/650kV,rms
7	Rated filling pressure of SF6 gas		0.6MPa,abs
8	Rated supply and control voltage		110V d.c.

Test items and performance

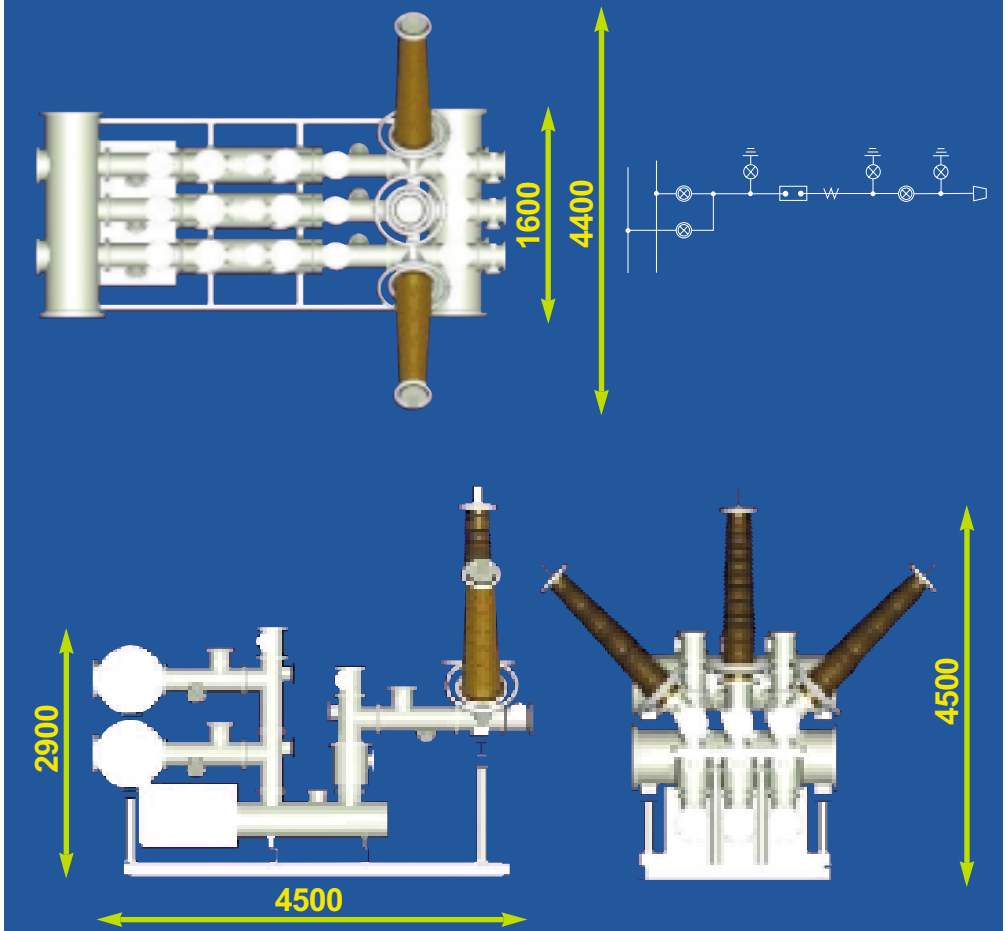
NO	TEST ITEM	ADDLIED STANDARDS
1	Sequence test	IEC60517
2	Charateristic of Contact travel	
3	Gas tightness test	
4	Measurement of resistance of the main circuit	
5	Mechanical operation test	
6	Temperature rise test	
7	Power frequence withstand test	
8	Lightning impulse withstand test	
9	Partial discharge test	
10	Power frequence withstand test on auxiliary circuit	
11	Radio interference voltage test	
12	Short time peak withstand current test	
13	Induced current switching test for ES	IEC61129
14	Making test for ES	EC60265-2
15	Bus-transfer current switching test for DS	IEC61128
16	Proof test for enclosure	IEC60517
17	Test under condition of arcing due to an internal arc	
18	Verification of degree of protection for auxiliary circuit and moving parts	

3-7. Typical Arrangements

Cable Head Feeder

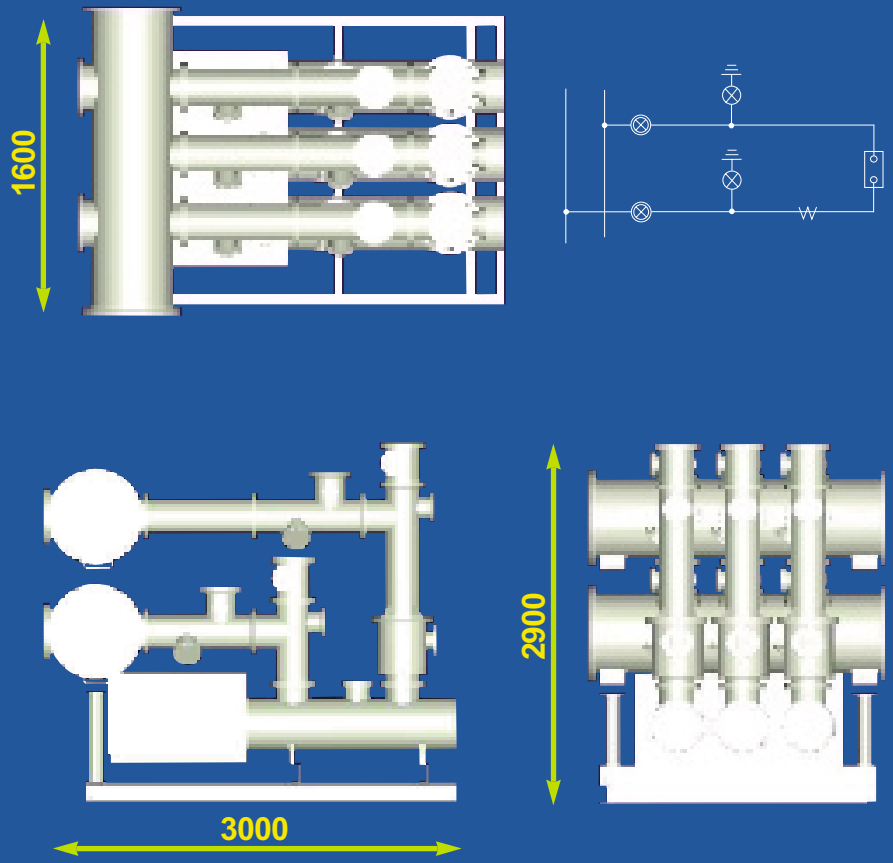


Duplicated Bus

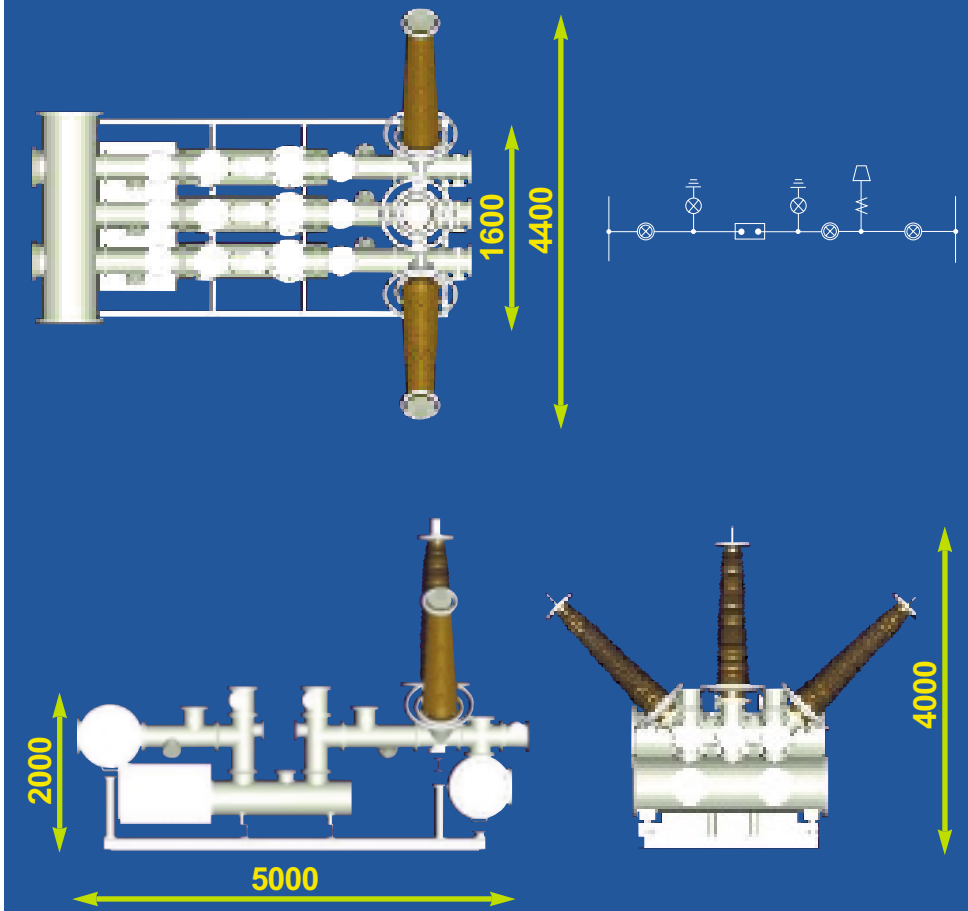


3-7. Typical Arrangements

Bus Coupler

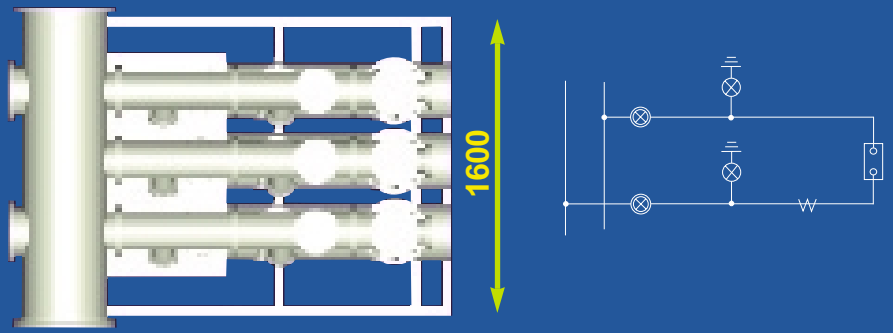


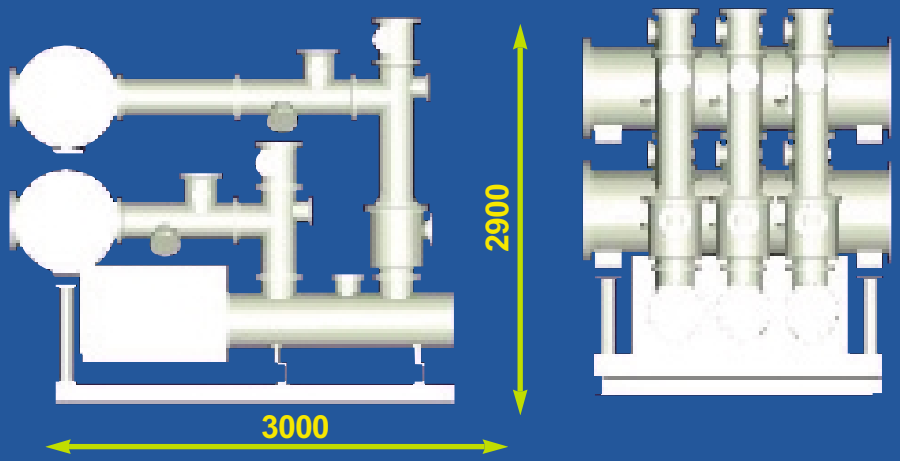
Duplicated Bus



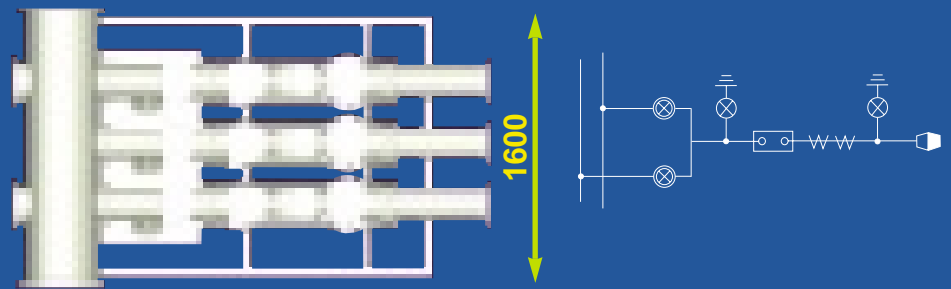
3-7. Typical Arrangements

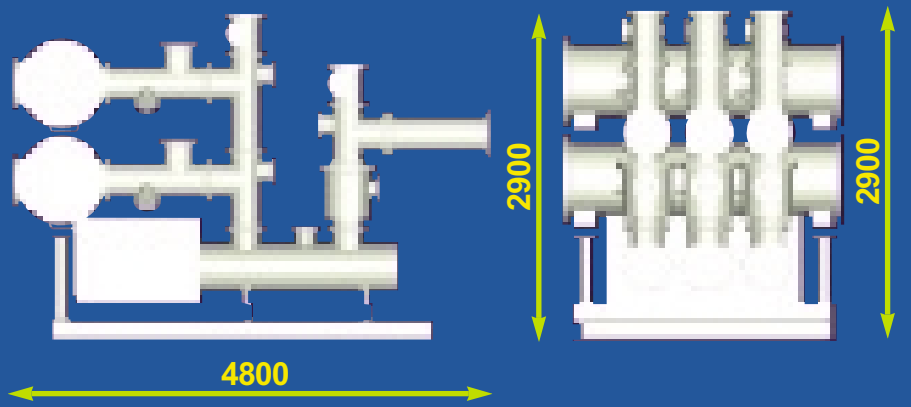
Bus Tie





Gas to Oil Bushing Feeder





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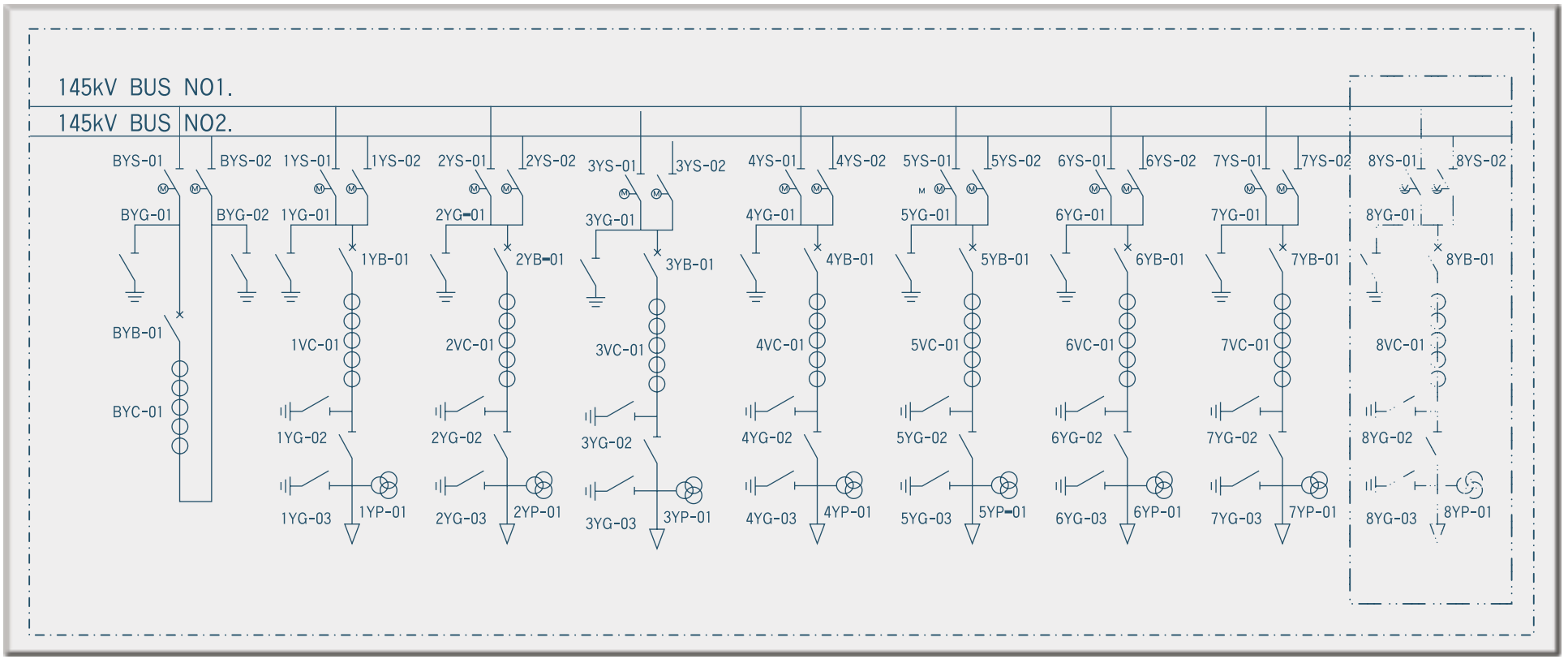
4. Single line diagram



SYMBOL	DESCRIPION	SYMBOL	DESCRIPION	SYMBOL	DESCRIPION
	CIRCUIT BREAKER 145kV, 2000A, 40kA		CURRENT TRANSFORMER		DISCONNECTING SWITCH MOTOR OPERATED TYPE
	DISCONNECTING SWITCH		LIGHTNING ARRESTER		GROUNDING SWITCH
	SWITCH WITH GROUNDING SWITCH		VOLTAGE TRANSFORMER		CABLE HEAD

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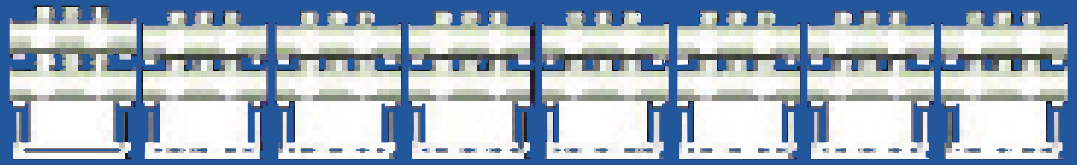
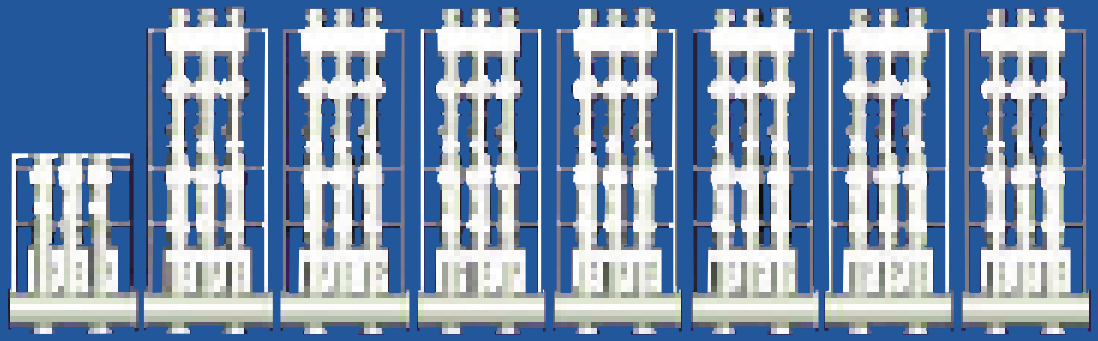
5. Layout plan of 145kV GIS

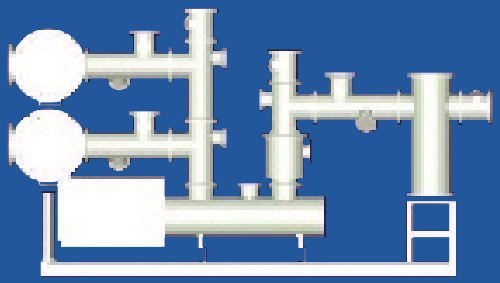
Constructions for layout plan

Front view of constructions

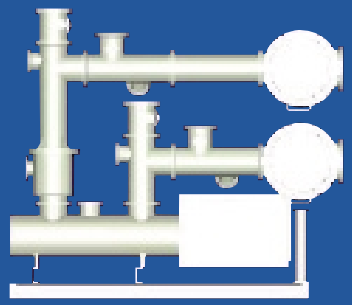


Top view of constructions





VIEW A



VIEW B

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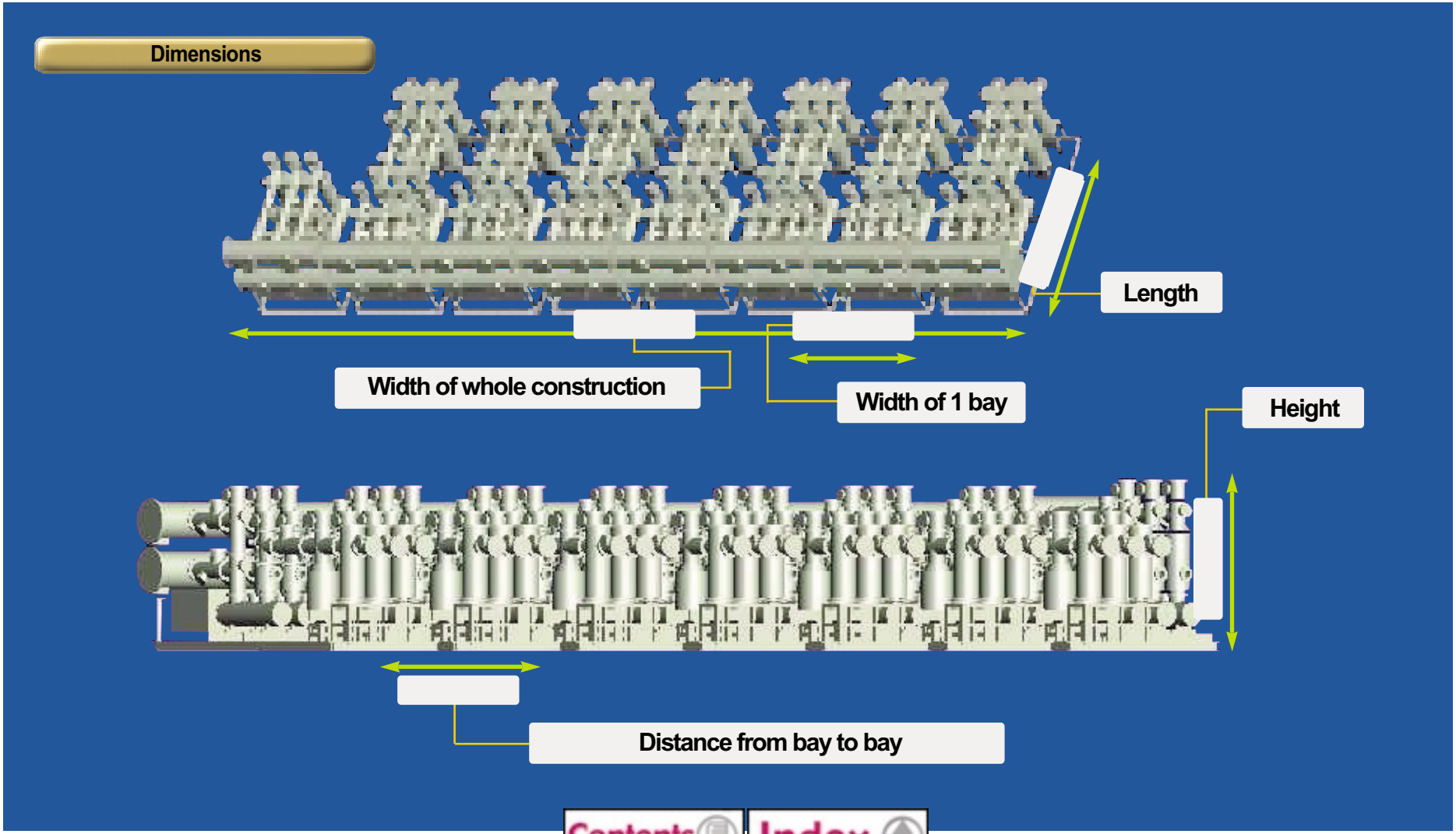
5. Layout plan of 145kV GIS



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LG constantly endeavors to improve our products, so that information in this catalog is subject to change without notice.

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